

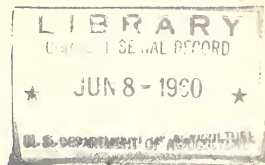
## Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



Ag84L  
Cop. 3

477



# GRASS WATERWAYS

## in soil conservation



UNITED STATES DEPARTMENT OF AGRICULTURE  
Leaflet No. 477

# GRASS WATERWAYS

## in Soil Conservation

By M. DONALD ATKINS, *plant materials specialist*, and JAMES J. COYLE, *agricultural engineer*, Soil Conservation Service

GRASS WATERWAYS are natural or manmade watercourses protected against erosion by a grass cover. They serve as safe outlets for terraces, diversions, and contour rows. They may also serve as passageways for water that enters your farm from other land.

Good grass waterways are a must in controlling erosion on many farms. If you do not have them or if they fail to work properly, all other parts of the erosion-control system for your field or farm may fail too.

The next time you have a heavy rain, take a good look at the natural drainageways and draws in your fields. Is there erosion in these low places where runoff water collects and flows swiftly downhill? If so, you should consider the need for grass waterways.

Your first thought may be that you do not want your fields cut up by waterways. But crossing grass waterways with modern farm machinery is not difficult. Made with gently sloping sides, waterways can be crossed easily with tractors. Power lifts simplify the job of raising and lowering tools during the crossing. It is better to put up with a small inconvenience now than to be blocked later by a gully.

Wherever you use a grass waterway you want a dense, vigorous growth of grass that will carry a flow of water

without erosion. Also, your grass waterway should be established before any water is turned into it. Thus it needs to be ready before you install the terraces, diversions, or contour rows that will discharge into it.

In addition, the waterway should be permanent. Some waterways can be successfully reworked but this may be difficult. The goal is a grass or grass mixture that you can maintain permanently or reestablish easily.

### Location and Size of Waterway

The best location for your waterway is a depression or draw that is a part of the natural drainage pattern. These places require a minimum of shaping. The soil here is usually deep and fertile, and moisture is favorable for good grass growth. Water from terraces, diversions, and rows can be guided into the waterway easily. But if your field has no natural draw you will need to construct a channel.

Your waterway should be wide enough and deep enough to hold the largest flow of water from the heaviest rain expected on an average of about once in 10 years. It should not overflow onto bare, unprotected soil. The size needed to carry the water depends on the soil, slope,



These waterways had a vigorous growth of grass before the terraces were installed.

KAN-1793

land cover, and land use and on how much land will drain into the waterway. In deciding on the size, consider whether you will use it as meadow. For best use as a meadow you may want to make it wider than you need for a waterway.

Shape the waterway to keep the water spread out so that it is not too deep at any point. A "dished" or parabolic shape does this best. Waterways shaped like a broad V are good if the sides of the V are laid back so that the top width is at least 12 times the depth. A flat-bottomed waterway with sloping sides is also satisfactory. But the side slopes must be gentle enough so that the waterway can be crossed with farm equipment and can be mowed. Make the center part of the waterway at least 1 foot below the ground on each side so that terraces, diversions, and rows can discharge water into it freely.

The SCS conservationist assisting your local soil conservation district can give you information on the location and size of waterway you need.

### Clearing and Shaping the Waterway

It is best to stake the outside edges of the waterway before starting to work. Plow along the stakes so that the width is well marked. Then remove all brush and trees from inside the marked area.

If you have any washes or gullies, fill them in. Compact the soil as much as possible in making the fills. Usually you can do this by making the fills in thin layers and running the tractor wheels over the area as you make the fills.

If a lot of earth must be moved, it is best to use a large tractor and scraper or a blade grader. If you use a scraper, the excavated earth may be used to fill small pockets in the field. In any case, spread the earth well back from the edges of the waterway. This allows water to enter at any point.

### Get Some Protective Cover Quickly

A newly shaped waterway usually has no vegetation or topsoil on parts of it. You may have serious erosion if you do not get a protective cover on it immediately.

On some you can seed your permanent grass at once. If so, it is good practice to apply a mulch cover to help hold moisture in the soil surface, improve infiltration, and prevent erosion while the grass is getting started.

But immediate seeding of your permanent grass may not be practical. You may be in an area where you need to plant a close-drilled annual crop and seed the perennial grass later in the stubble or residue, or your waterway construction may be completed at the wrong season for perennial grass seeding.

Sudangrass, forage sorghum, miller, or thickly seeded corn make a good stubble ahead of grass planting. Rye, oats, or ryegrass gives good temporary protection for waterways completed at a season when you cannot seed perennial grass. Sometimes such crops can be planted when it is too late for them to mature seed. If you must plant them at the regular planting time, however, clip the crop before it matures seed.



IND-30,011

Erosion in an unprotected natural drainageway.



KAN-1775

Clearing and shaping a gullied drainageway for grass seeding.



NEBR-1445-C

A shaped waterway ready for seedbed preparation and seeding or sodding.





This smooth brome waterway is an outlet for excess water from the terraces and contour rows.



Native grass waterway of switchgrass and big bluestem planted on eroded claypan soil.



Bahiagrass waterway.

## Choose Grasses That Fit Your Soil and Site

In establishing grass waterways, choose sod-forming grasses with deep, dense root systems well adapted to your soil and site. It is best to use one grass or a simple mixture of two or three grasses.

Commonly used grasses include smooth brome, tall fescue, redtop, Kentucky bluegrass, Pensacola bahiagrass, and bermudagrass. These introduced grasses usually grow faster at the start and can be more quickly established than native grasses. But many of them require soil with good tilth and high fertility. They also require regular fertilizing and careful management.

This has led to increased use of native grasses where they can be used effectively. Though they may be slower to establish, they are locally adapted and therefore hardy. They use little fertility and thrive with minimum care.

Part or all of your waterway may be wet or have saline or alkali concentrations. If so, use a grass tolerant of that condition. Reed canarygrass, prairie cordgrass, and tall fescue are well adapted to wet sites. Tall wheatgrass and western wheatgrass have greater tolerance to saline and alkali soils than most of the grasses commonly used in waterways.

Usually a legume should not be included in the grass mixture. Legumes are often short-lived, and when they die they leave bare spots where erosion may begin before grass covers the area. Then, too, some are large plants that have bare spots between them. Exceptions are birdsfoot trefoil, which survives well with grass in the Northeast, and sericea lespedeza, which works well with bahiagrass in the Southeast. Here, several reseeded annual legumes have also been successful with grass.

See the table on page 7 for list of grasses and legumes adapted for use in waterways in given areas. Location of the different areas is shown on the map on page 6. The SCS conservationist assigned to your soil conservation district or your county agent can help you decide on the best grass for your soil and site.

## Use Adapted Seed of High Quality

Seed from grass plants of a specific origin is adapted to a definite area. Planted outside that area, it is unsatisfactory. Where the seed was grown may not be as important as where the plant originated. Before buying seed, find out all you can about its adaptation.

Seed quality is also important. You should seldom use seed without a laboratory test because planting rates are based on seed size and quality. Grass seed may range from 20 to 100 percent purity. The range in germination may be equally wide. Seeding rates are aimed at planting a given number of pure live seed per square foot. A seeding rate about double that for field planting is commonly recommended for waterways to insure a good initial stand of grass seedlings.

## Planting and Fertilizing

For successful grass seeding, you need a very firm seedbed and an adequate crop residue or mulch.



IA-2709

A smooth brome waterway in an oat field.

Grass hay provides the best mulch. Small grain straw, strawy manure, and similar material may also be used. The amount depends on the kind of mulch and the slope of the waterway. Usually from 1 to 2 tons per acre will give the necessary protection.

Be sure to spread the mulch evenly. The soil surface should be visible through the mulch. Anchor hay or straw mulch in the surface soil if possible. You can do this with a disk harrow set with just enough pitch to punch the straw into the soil. Notched coulters designed for this purpose do a particularly good job.

Generally cool-season grasses respond best to fall planting, although in some locations you can get good results from early spring planting. Warm-season grasses do best when spring planted. The time to make fall or spring planting differs with the specific grasses and the locality.

Planting with seed is by far the most common method of establishing grass in waterways. One method of seeding, usually called the hay method, can be used if conditions are right. It consists of mowing hay when the seed is mature and spreading the freshly cut green hay on the prepared waterway. This method assures a mulch with the seeding. It also assures adapted seed since they are locally grown. But you can use it only when you have a good hayseed crop at the time and at the place you want to seed the waterway.

Sprig planting is most commonly used for planting bermudagrass. It is also used for planting reed canarygrass and cordgrass in wet, seepy waterway sites. Digging, transporting, and planting of sprigs present problems you do not have with seeding. Sprigs must be kept moist and free of mold until planted. Therefore, it is best to get the sprigs in the vicinity of the waterway to be established.

Reed canarygrass can also be established on wet sites by spreading the freshly cut green hay and working it into the soil.

Double drilling of the waterway gives better distribution of seed and helps to spread the water while plants are small. Drill first lengthwise and then crosswise in a zig-zag pattern.

Regardless of the planting method, some special equipment is usually required. Uniform distribution of the seed and planting at the right depth are just as important for grass as for other crops.

In some instances regular farm equipment or attachments can be adapted for planting grass seed. In others, specially designed drills are essential for good results. Drilling is better than broadcasting because it places the seed at the right depth. Some grasses should be planted  $\frac{1}{2}$  inch deep, others 1 inch; few can be safely planted deeper than 1 inch.

Grass-planting equipment is being improved all the time. You can get drills that plant seeds like brome-



TEX-49-342

A bermudagrass waterway, established with sprigs, also serves as field border.



KAN-1776

An 8-year-old smooth brome waterway on deep, fertile soil.



ILL-810

Mowing waterway for hay.



WN-90,010

Newly seeded waterway, double drilled with figure 8 pattern to help spread water.

grass and the native bluestems as well as small clean seeds, and drills with furrow openers that place seed at controlled depths and plant in mulch seedbeds. There are also bermudagrass sprig planters.

This mechanical sprig planter and the special grass seed drills have become popular in many soil conservation districts. Districts buy them and rent them to their cooperators. This has made their use practical even on small waterways.

Generally you should fertilize introduced grasses heavily at seeding time. Usually it will pay you to have your State experiment station make a soil test to find out what elements your soil needs. This will help you judge how much fertilizer you can profitably apply. The test will also show if your soil needs lime.

Place the fertilizer below or close to the seed but not

in contact with it. You can get special drills that place it in bands 1 to 2 inches below the seed.

Native grasses in most places should not be fertilized at seeding time. Since they are slow in germination and seedling growth, they do not take advantage of high plant-nutrient supplies. As a result the fertilizer often benefits weed growth that competes with the seeded grass.

### Take Special Care While Grass Is Getting Started

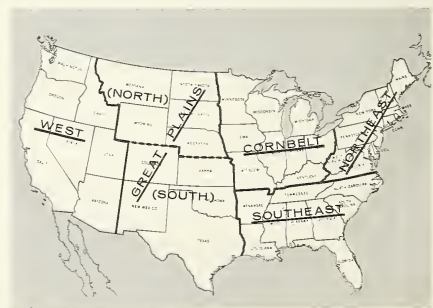
Your waterway will need attention while the grass is getting established. Look it over after each rain. Fill and smooth all washed places. Use topsoil in making fills. Reseed these places or repair them with sod. Do not run equipment over the waterway any more than is necessary. Avoid all travel up and down the waterway. If you have heavy weed growth, mow or spray for control. Keep out livestock until grass is well established.

In some places you may need to build temporary diversion dikes along the sides and across the top of the waterway to keep flow to a minimum. But you should not do this on soils that erode easily because of the danger of gulying. As soon as the grass has good growth, smooth down the temporary dikes and fill in all washes.

### Making Full Use of Your Waterway

A grass waterway is not a waste area. It is an essential part of the soil and water conservation treatment of your farm. And you can use it for pasture or hay. Some farmers use waterways for seed production, but this requires careful management.

Moderate use for pasture or hay is one of the best ways to maintain grass vigor. Control grazing on the waterway as you would on well-managed pasture or rangeland. Leave enough plant growth to maintain a healthy, vigorous stand. Do not mow or permit cattle to graze the waterway when the soil is wet and soft. Mow when your grass can make good regrowth and restore food reserves in the roots. Grass should go into



Location of areas referred to in text and table.



## Grasses and legumes commonly used in waterways in given areas

Grass or legume	Northeast	Cornbelt	Southeast	Great Plains		West
				North	South	
Kentucky bluegrass						
Redtop						
Tall fescue						
Smooth brome						
Red fescue						
Timothy						
Reed canarygrass						
Birdsfoot trefoil						
Orchardgrass						
Pensacola bahiagrass						
Bermudagrass						
Zoysia						
Sericea lespedeza						
Crimson clover						
Kudzu						
Intermediate wheatgrass						
Western wheatgrass						
Switchgrass						
Big bluestem						
Tall wheatgrass						
Indiangrass						
Crested wheatgrass						
Sideoats grama						
Siberian wheatgrass						
Buffalograss						
Beardless wheatgrass						
Streambank wheatgrass						
King Ranch bluestem						
Pubescent wheatgrass						
Creeping meadow foxtail						
Lehmann lovegrass						
Hardinggrass						
Prairie cordgrass						

critical summer heat and into the winter with about 6 inches top growth.

Managing waterways for seed production does not encourage the dense, leafy growth at the ground surface needed for erosion control. If you remove a hay crop after seed harvest, your waterway is even more vulnerable to erosion. Also, the grass plants are apt to be weakened and unable to make satisfactory regrowth. If you want your waterway to carry heavy flows without erosion, make your goal a good sod rather than a good seed crop.

How much and how often to fertilize will depend on your locality, soil, and the kind of grass you use. Your objective is to keep a vigorous dense grass growth.

Some grasses need more fertilizer, particularly nitrogen, than others. Most native grasses need no fertilizing. Introduced grasses will nearly always need heavy annual applications of nitrogen. Soil tests will show how much and whether you need to add phosphorus, potash, or other soil elements.

The most common causes of waterway failure are abuse and neglect. Careless crossing with farm implements tears out spots of grass. Using it as a field road leads to bare areas vulnerable to erosion. If occasionally you must use your waterway as a road, travel along the edge, not down the center. At all times maintain your waterway so that it supports the other conservation practices.

To establish and maintain an effective grass waterway:

1. Locate waterway in a natural drainageway if possible.
2. Clear trees or brush from the site and shape to proper size.
3. Prepare a good, firm seedbed and use a crop residue or a mulch to protect the waterway and grass seedlings during establishment.
4. Select a grass or simple grass mixture that best fits the conditions of the waterway.
5. Use good quality seed.
6. Use grass origins and strains known to be adapted.
7. Plant at the best date for the particular grass.
8. Use planting equipment and methods that give uniform distribution and proper placement of seed.
9. Fertilize according to the needs of the grass and your soil as shown by soil tests.
10. Overseed or repair bare spots with sod chunks or mulch as necessary.
11. Avoid using the waterway as a road or damaging the sod with tillage implements. If you must use it occasionally, travel along the edges of the waterway, not down the center.
12. Use the waterway moderately for grazing or hay.
13. Mow when grass can make good regrowth and restore food reserves in the roots.
14. Inspect frequently, especially after each heavy rain. Repair damages at once.
15. Keep livestock and equipment out of the waterway when it is wet and soft unless it is naturally a seepy area.

This publication supersedes Leaflet 257, Grass Waterways. Washington, D.C. Issued June 1960.

U.S. GOVERNMENT PRINTING OFFICE : 1960 OF - 543474

---

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25 D.C. - Price 10 cents